3. Alignment and Adjustment

3-1 Mechanism Alignment

• The location of test point (See Fig.3-1)

Test Point:
PB RF - Pin 11 of CN452
Head Switching Trigger - Pin 9 of CN452

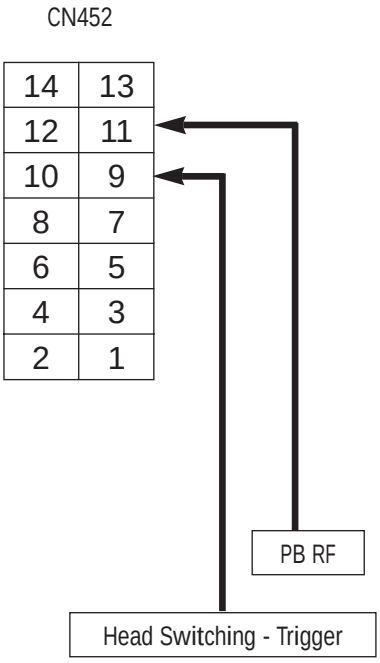


Fig. 3-1 Test point

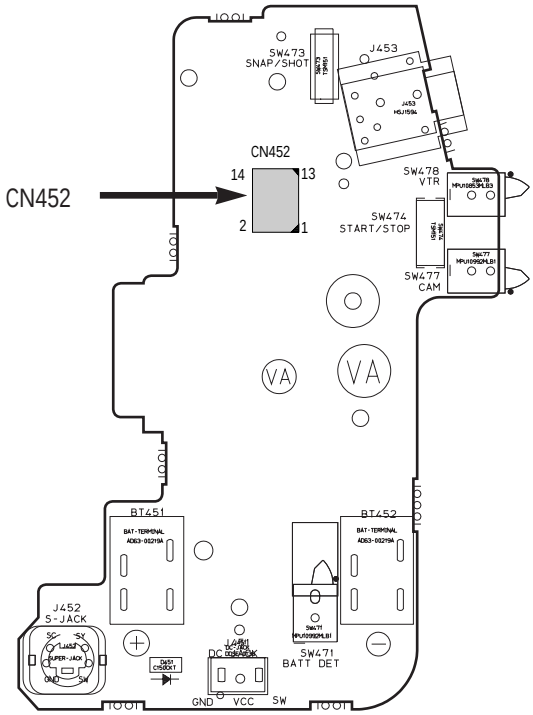


Fig. 3-2 Test location of test point (Rear Board)

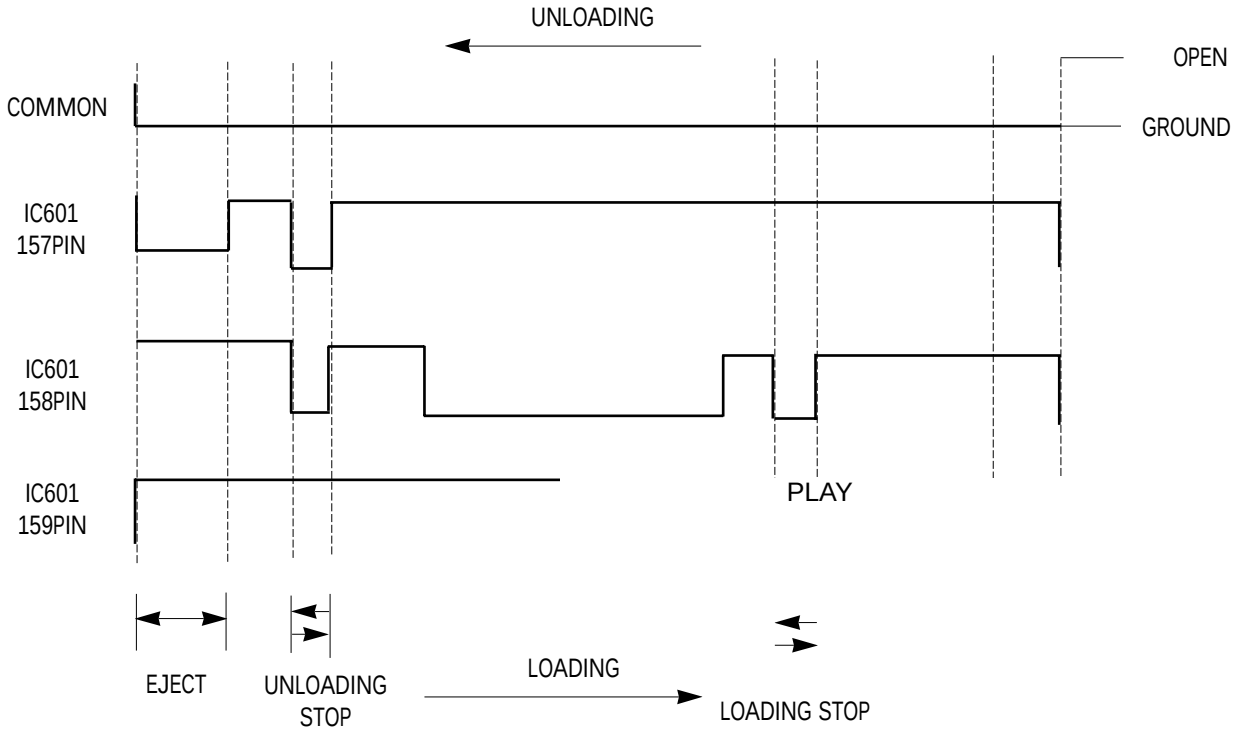


Fig. 3-3

Table. 3-1

POSITION	IC601 157PIN	IC601 158PIN	IC601 159PIN	ACTION MODE
EJECT	L	H	H	EJECT
UNLOADING STOP	L	L	H	UNLOADING STOP
LOADING STOP	H	L	L	LOADING STOP
PB	H	H	L	PLAY, FF, REW, STILL....

3-2 Camera Adjustment

Note :

1. This system has :

   1) EEPROM to store the confirmed adjustment data.
   2) DSP (Digital Signal Process ; ICP01 - Main board) chip to process the signal of camera parts.
   3) The special mode for camera adjustment using the remote controller.

2. Keep in mind :

   1) All adjustment steps should be performed using the remote controller.

3-2-1 Preparations

1. Equipment to be used :

1) DC Power supply
2) Oscilloscope
3) Frequency counter
4) Vectorscope
5) Waveform monitor
6) Color monitor or TV
7) Various charts
   - Color bar chart
   - Gray-scale chart, etc...

2. Composition of camera P.C.Boards :

1) Main PCB 2) CCD PCB
3) CVF PCB

3. Adjustment preparations :

1) Some buttons of set is used as a camera adjust tool.
2) Press the confirm button when each manual adjustment step is completed to write the adjustment data to the EEPROM.
3) After each adjustment step is completed, OSD shows “OK!”.
4) To cancel the adjustment mode, remove the power source.

4. Remote control :

The following is a chart explaining the use of each button :

Table. 3-2

Using Button	Adjustment
ENTER (CONFIRM)	Data store after finishing adjustment by DATA UP/DOWN button.
P.AE (DATA UP) DSE (DATA DOWN)	When change data value of adjust state.
BLC (MODE UP) FADE (MODE DOWN) MENU ON/OFF (MODE UP ‘100’)	Mode change.(One step or 100 step)
MANUAL FOCUS RING (NEAR/FAR)	Manual focus adjustment.
ZOOM TELE ZOOM WIDE	1) Move the zoom position of lens. 2) Semi-Auto lens adjustment.

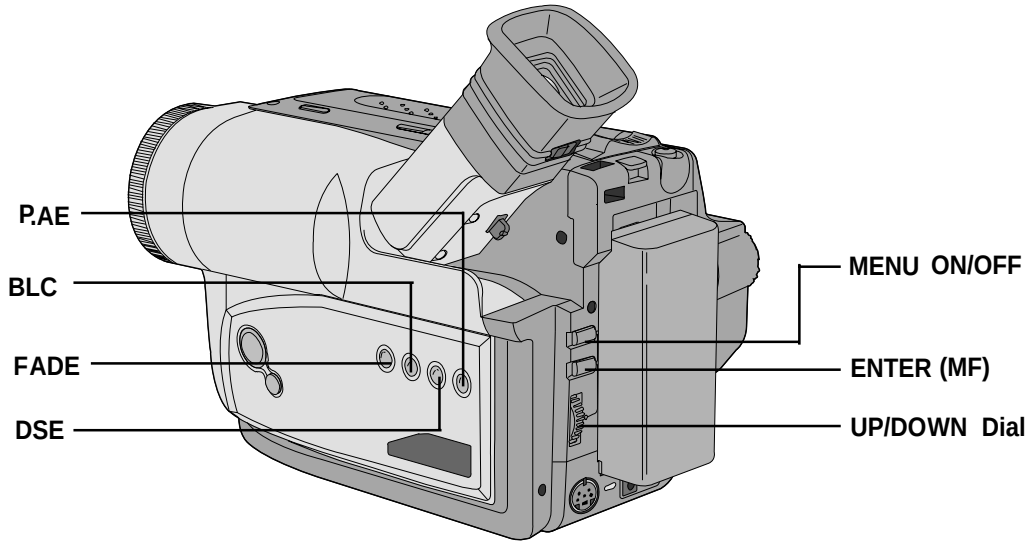


Fig. 3-4

Note : In service adjustment mode, button names are different from those in customer camera function control mode. EX) ENTER button is the same as confirm.

5. How to get into service "**ADJUST**" mode

STEP 1

1. Remove the lithium battery from the camcorder.
2. Connect the power source (battery / DC cable).
3. Eject the tape if it is in the unit.
4. Set the power switch of the camcorder to "CAMERA" position.

STEP 2

1. Press and hold the "EJECT" button and DATE / TIME button on the camcorder at the same time for more than 5 seconds. Then unit goes into service mode.

STEP 3

0DF.
ERR : A0 EVR : A0

Note : When "XX XX" is shown in service adjustment procedures, this indicates variable values.

3-2-2 Camera System Adjustment

Note : The on-screen display information.
"XX XX" means arbitrary value.
It can be different number depend on the conditions.

0DE	XX	XX

1. Focus to zoom tracking

Notes : To maintain proper focus throughout the zoom range, the focus lens position must be changed as the zoom lens is moved.
During this adjustment the microprocessor will measure the focus positioning requirements at the wide and telephoto position of the zoom lens.

1) Camera "E-E".
2) Focus chart (Attached on the last page of this manual).
3) Aim the camera at the focus chart placed 3 meters away and perpendicular to the center of the lens.
The chart should be placed on the flat, gray or white wall.
4) Connect monitor TV jack to video output jack.
5) Press the "BLC(MODE UP)" and "FADE(MODE DOWN)" button, so that the OSD start is "0DE. 3M LENS XX XX".
6) Press "ENTER(CONFIRM)" button.
The camera will move both zoom and focus lens.
The adjustment is finished when the O.K! message appears on the TV screen.
Store the data to mode 099, 09A, 0AA, 0AB, 0AD, 0C9, 0CA, 0CB and 0CC.

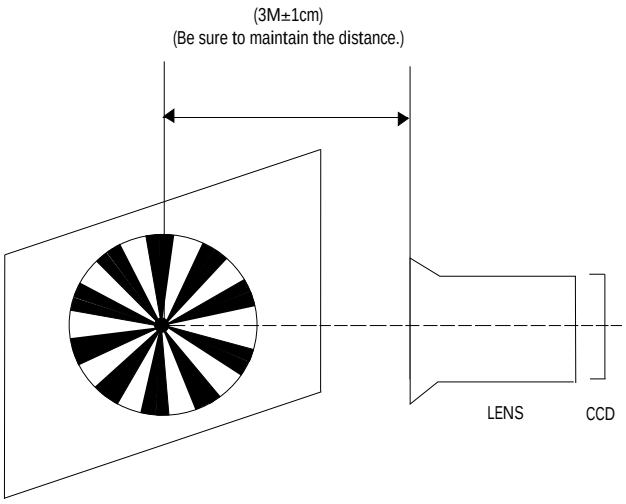


Fig. 3-5

2. Zoom VR Center

1) Camera “E-E”, 3100°K gray-scale chart.
2) Video(output) jack and EVR.
3) Connect monitor TV to video(output) jack.
4) Press the “BLC (MODE UP)/FADE(MODE DOWN)” button so that the OSD state is “OD6. XX XX”.
5) Press “ENTER(CONFIRM)” button.
6) Then, the microprocessor will work ;
   - Find the Zoom VR Center position
   - Store the data to mode 0B7.

3. Auto hall

1) Camera “E-E”, 3100°K gray-scale chart.
2) Video(output) jack and EVR.
3) Connect monitor TV to video(output) jack.
4) Press the “BLC(MODE UP)/FADE(MODE DOWN)” button so that the OSD state is “OCD. XX XX”.
5) Press “ENTER(CONFIRM)” button.
6) Then, the microprocessor will work ;
   - IRIS open, HALL maximum value found,
   - IRIS closed, HALL minimum value found,
   - IRIS open, HALL maximum value found,
   - Store the data to mode 00A and mode 00B.
   - Store the HALL min./max. data to mode 0C1 and mode 0C2.

4. AUTO IRIS

1) Camera “E-E”, 3100°K gray-scale chart.
2) Video(output) jack and AF MICOM.
3) Connect video(output) jack to waveform monitor input jack and monitor TV jack respectively.
4) Press the “BLC(MODE UP)/FADE(MODE DOWN)” button so that the OSD state is “OCE. XX XX”.
5) Press “ENTER(CONFIRM)” Button.
6) Then, the micro process will work;
   - IRIS open, IRIS control minimum Value found.
   - IRIS close, IRIS control minimum Value found.
   - Store the data to mode 0B5, 0B6, 0C7 and 0C8.
7) The OSD shows “O.K”.

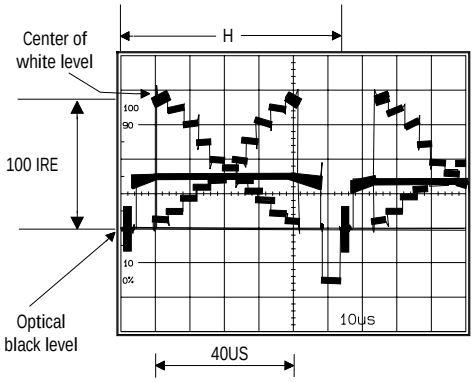


Fig. 3-6

5. Auto white balance

1) Camera “E-E”, 3100°K/5100°K gray-scale chart.
2) Video(output) jack and AF MICOM.
4) Connect vectorscope input jack to video(output) jack.
3) Press the “BLC(MODE UP)/FADE(MODE DOWN)” button so that the OSD state is “OCF. XX XX”.

a. W/B Indoor
a-1. Aim the camera at a 3100°K gray-scale chart illuminated at 1500 to 2000 lx. (40us)
a-2. Press “ENTER(CONFIRM)” button so that the white vector moves to the center on screen of the vectorscope.
a-3. Store the data to mode 0A6, 0A7, 0A8, 0A9
a-4. The OSD shows “OK!”.

b. W/B Outdoor
b-1. Aim the camera at a 5100°K gray-scale (3100°K+CCB12) chart illuminated at 1500 to 2000 lx. (40us)
b-2. Press “ENTER(CONFIRM)” button so that the white vector moves to the center on screen of the vectorscope.
b-3. Store the data to mode 0A2, 0A3, 0A4 and 0A5.
b-4. The OSD shows “OK!”.

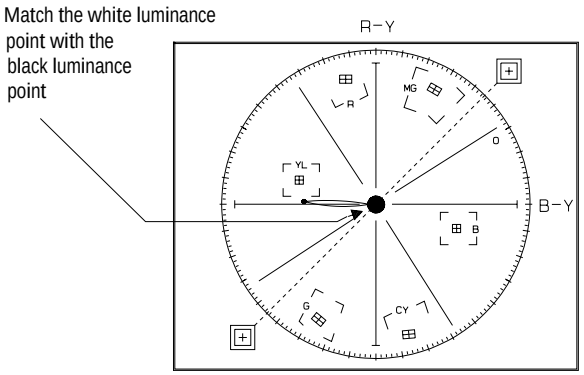


Fig. 3-7

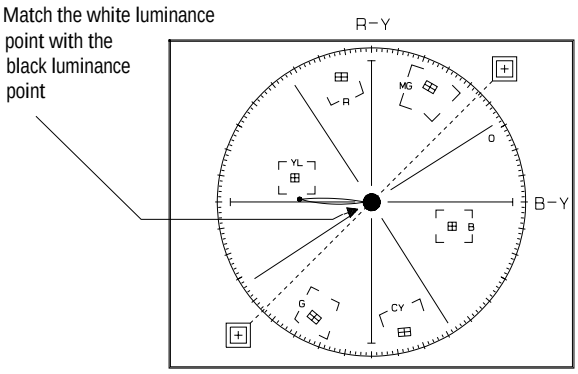


Fig. 3-8

6. Pre white balance (I) ; (R-Y)

1) Camera “E-E”, 3100°K gray-scale chart.
2) Video(output) jack and AF MICOM.
3) Connect vectorscope input jack to video(output) jack.
4) Press the “BLC(MODE UP)/FADE(MODE DOWN)” button so that pass through 272, 273, 274, 275 and then the OSD state is “272. XX XX(High)””273. XX XX(Low)”.
5) Aim the camera at a 3100°K gray-scale chart illuminated at 1500 to 2000 lx.
6) Adjust the “ P.AE(DATA UP)/DSE(DATA DOWN)” button so that the white vector moves to the R-Y axial on screen of the vectorscope.

Note : Bright dot shifts after the confirm button is pressed.

7. Pre white balance (II) ; (B-Y)

1) Camera “E-E”, 3100°K gray-scale chart.
2) Video(output) jack and AF MICOM.
4) Connect vectorscope input jack to video(output) jack.
3) Press the “BLC (MODE UP)/FADE(MODE DOWN)” button so that the OSD state is “274. XX XX(High)””275. XX XX(Low)”.
5) Aim the camera at a 3100°K gray-scale chart illuminated at 1500 to 2000 lx.
6) Adjust the “P.AE(DATA UP) /DSE(DATA DOWN)” button so that the white vector moves to the B-Y axial on screen of the vectorscope.

Note : Bright dot shifts after the confirm button is pressed.

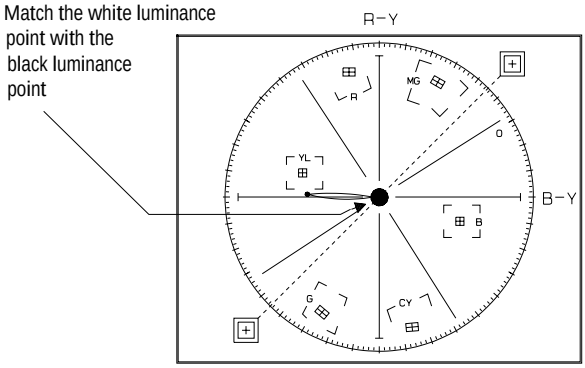


Fig. 3-9

8. R-Y Gain

1) Camera “E-E”, 3100°K color bar chart.
2) Video(output) jack and register of EEPROM.
3) Connect video(output) jack to waveform monitor input jack and monitor TV jack respectively.
4) Press the “BLC(MODE UP)/FADE(MODE DOWN)” button so that the OSD state is “280. XX XX(High)””281. XX XX(Low)”.
5) Aim the camera at a color bar chart illuminated at 1500 to 2000 lx.
6) Adjust the “P.AE(DATA UP)/DSE(DATA DOWN)” button so that the red level is NTSC : 70IRE, PAL : 500mV
7) Be sure to press the “ENTER(CONFIRM)” button to memorize setting.

Note : Bright dot shifts after the confirm button is pressed. (outdoor : 034, 035)

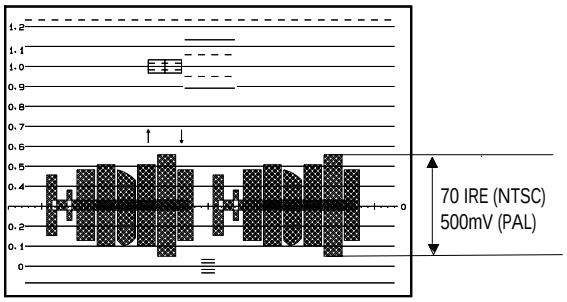


Fig. 3-10

9. B-Y Gain

1) Camera “E-E”, 3100°K color bar chart.
2) Video(output) jack and register of EEPROM.
3) Connect video(output) jack to waveform monitor input jack and monitor TV jack respectively.
4) Press the “BLC(MODE UP)/FADE(MODE DOWN)” button so that the OSD state is “283. XX XX(High)””284. XX XX(Low)”.
5) Aim the camera at a color bar chart illuminated at 1500 to 2000 lx.
6) Adjust the “P.AE(DATA UP)/DSE(DATA DOWN)” button so that the blue level is NTSC : 50IRE, PAL : 350mV
7) Be sure to press the “ENTER(CONFIRM)” button to memorize setting.

Note : Bright dot shifts after the confirm button is pressed.
(outdoor : 036, 037)

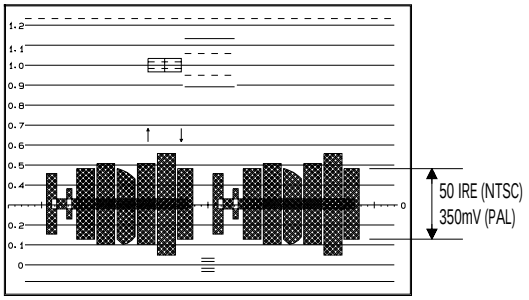


Fig. 3-11

10. R-Mg Hue

1) Camera “E-E”, 3100°K color bar chart.
2) Video(output) jack and register of EEPROM.
3) Connect video(output) jack to vectorscope input jack and monitor TV jack respectively.
4) Press the “BLC(MODE UP)/FADE(MODE DOWN)” button so that the OSD state is “284. XX XX(High)””285. XX XX(Low)”.
5) Aim the camera at a color bar chart illuminated at 1500 to 2000 lx.
6) Adjust the “P.AE(DATA UP)/ DSE(DATA DOWN)” button so that theRed vector is 105.
7) Be sure to press the “ENTER (CONFIRM)” button to memorize setting.

Note : Bright dot shifts after the confirm button is pressed.
(outdoor : 038, 039)

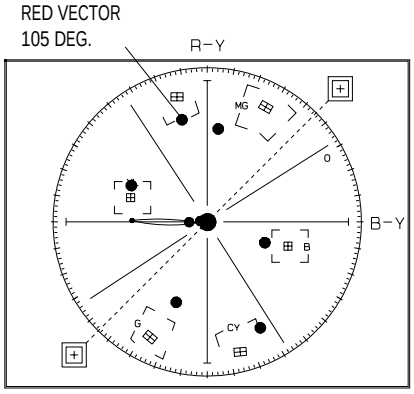


Fig. 3-12

11. G-Cy Hue

1) Camera “E-E”, 3100°K color bar chart.
2) Video(output) jack and register of EEPROM.
3) Connect video(output) jack to vectorscope input jack and monitor TV jack respectively.
4) Press the “BLC(MODE UP)/FADE(MODE DOWN)” button so that the OSD state is “286. XX XX(High)””287. XX XX(Low)”.
5) Aim the camera at a color bar chart illuminated at 1500 to 2000 lx.
6) Adjust the “P.AE(DATA UP)/ DSE(DATA DOWN)” button so that the Cyan vector is 284.
7) Be sure to press the “ENTER (CONFIRM)” button to memorize setting.

Note : Bright dot shifts after the confirm button is pressed.
(outdoor : 03A, 03B)

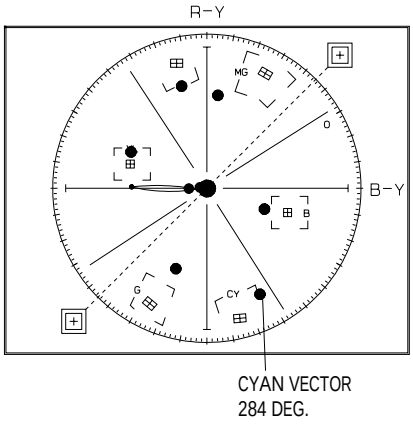


Fig. 3-13

12. B-Cy-Mg Hue

1) Camera “E-E”, 3100°K color bar chart.
2) Video(output) jack and register of EEPROM.
3) Connect video(output) jack to vectorscope input jack and monitor TV jack respectively.
4) Press the “BLC(MODE UP)/FADE(MODE DOWN)” button so that the OSD state is “288. XX XX(High)””289. XX XX(Low)”.
5) Aim the camera at a color bar chart illuminated at 1500 to 2000 lx.
6) Adjust the “P.AE (DATA UP)/ DSE(DATA DOWN)” button so that the Blue vector is 346.
7) Be sure to press the “ENTER (CONFIRM)” button to memorize setting.

Note : Bright dot shifts after the confirm button is pressed.
(outdoor : 03C, 03D)

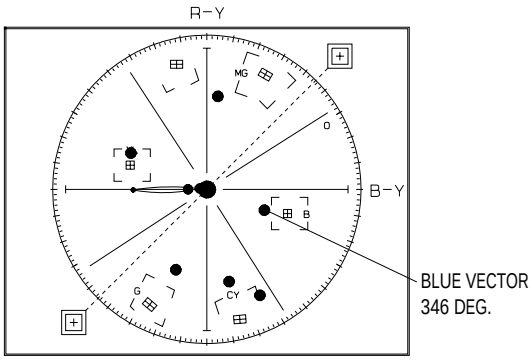


Fig. 3-14

13. Ye-G Hue

1) Camera “E-E”, 3100°K color bar chart.
2) Video(output) jack and register of EEPROM.
3) Connect video(output) jack to vectorscope input jack and monitor TV jack respectively.
4) Press the “BLC(MODE UP)/FADE(MODE DOWN)” button so that the OSD state is “28A.XX XX(High)””28B.XX XX(Low)”.
5) Aim the camera at a color bar chart illuminated at 1500 to 2000 lx.
6) Adjust the “P.AE(DATA UP) /DSE(DATA DOWN)” button so that the Yellow vector is 165.
7) Be sure to press the “ENTER(CONFIRM)” button to memorize setting.

Note : Bright dot shifts after the confirm button is pressed.
(outdoor : 03E, 03F)

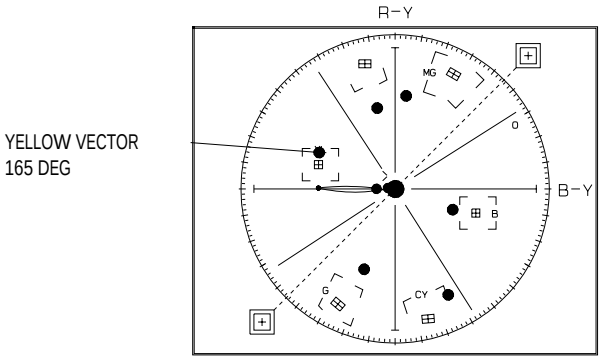


Fig. 3-15

Note : Outdoor(5100°K) color Gain & Hue adjust.
- 5100°K color bar (or 3100°K color bar with CCB12 Filter)
- Restart step 7. prewhite balance(I) ~ step 14. Ye-G Hue.
- The outdoor(5100°K) mode in 034~03F.

3-3 VCR Adjustment

3-3-1 Peraration

1. Equipment :

1) Monitor TV.
2) Dual trace oscilloscope of over 20MHz band, incorporates delay mode.
   (Use 10 : 1 probe unless otherwise specified.)
3) Frequency counter
4) DC power supply.
5) Alignment tape (Colour bar : SP)
6) 8mm Video Tape for record.

2. Composition of VCR P.C.Boards

1) Main PCB (system control / servo, video, audio, camera)
2) Rear PCB
3) Front PCB
4) Function PCB

3. How to get into service "**ADJUST**" mode.

STEP 1

1. Connect the power source (battery/DC cable).
2. Set the program selector of the camcorder to PLAYER position.
3. Press the eject key to eject mode.

STEP 2

1. Press and hold "STOP" and "EJECT" button on the Camcorder at the same time for more than 5 seconds.
2. If the adjustment mode displayed like the figure below, VCR adjustment mode has been successfully activated.
3. Insert tape into housing ass'y and then perform the adjustments.

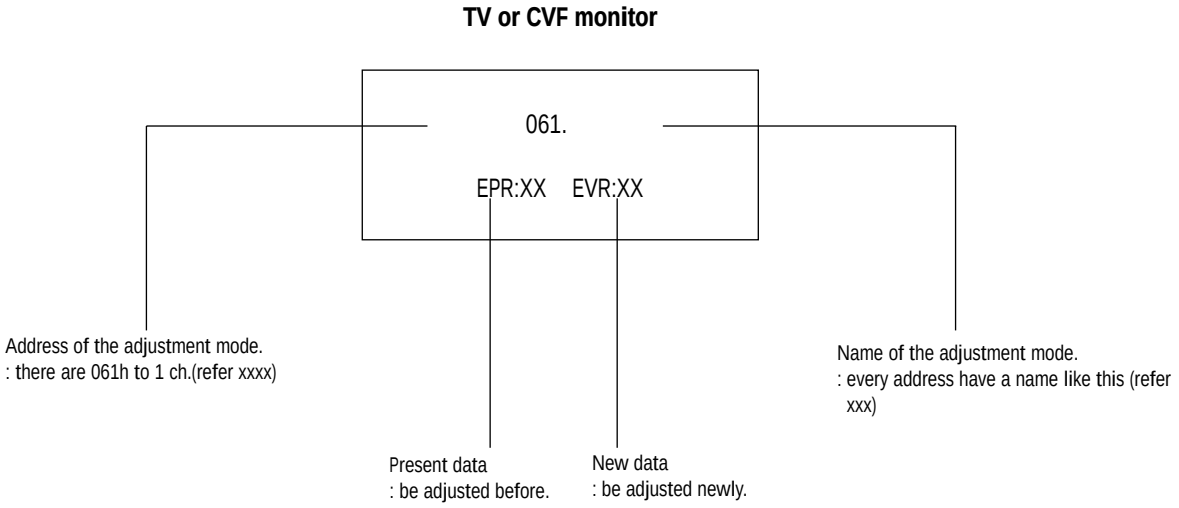

TV or CVF monitor
061.
EPR:XX EVR:XX
Address of the adjustment mode.
: there are 061h to 1 ch.(refer xxxx)
Name of the adjustment mode.
: every address have a name like this (refer xxx)
Present data
: be adjusted before.
New data
: be adjusted newly.

Fig. 3-16

4. The location of function button.

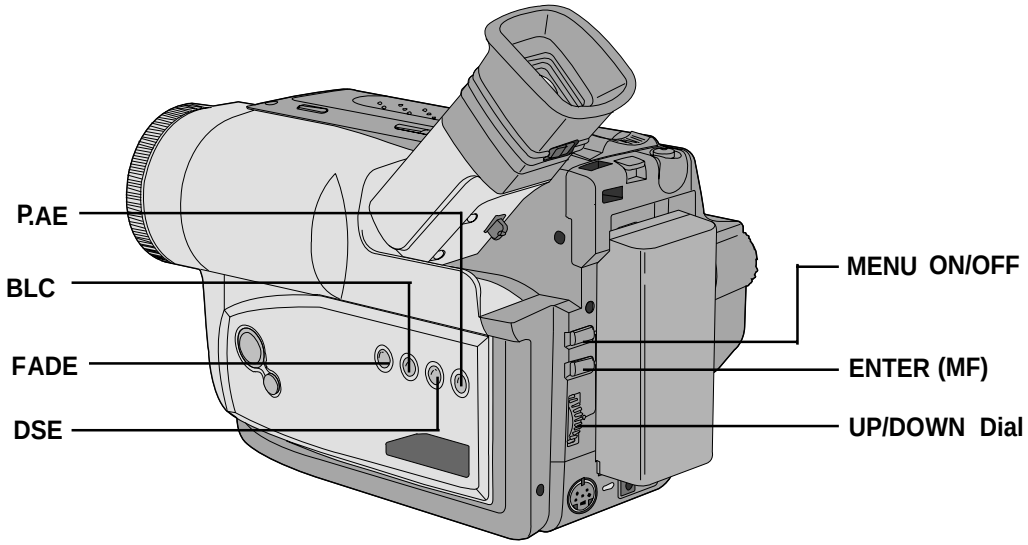


Fig. 3-17

Note : In service adjustment mode, button names are different from those in customer function control mode.
EX) “ENTER” button is the same as “CONFIRM”.

5. If you want to finish the adjustment mode, you have to do “Battery Reset”.
The “Battery Reset” means that you pull out the power source and pull in it again.
Then, the adjustment is ended and the camcorder works normally.

3-3-2 VCR Section

Note 1 : From this point forward, the structure of every adjustment is as follows.

Step	Adjustment Item
1. Mode and input signal/ alignment tape 2. Test point and ADJ. part 3. Result and Remarks	

ADJ. point

Test point

Note 2 : How to connect video out signal.

-Connect the video cable to ass'y A / V Jack.

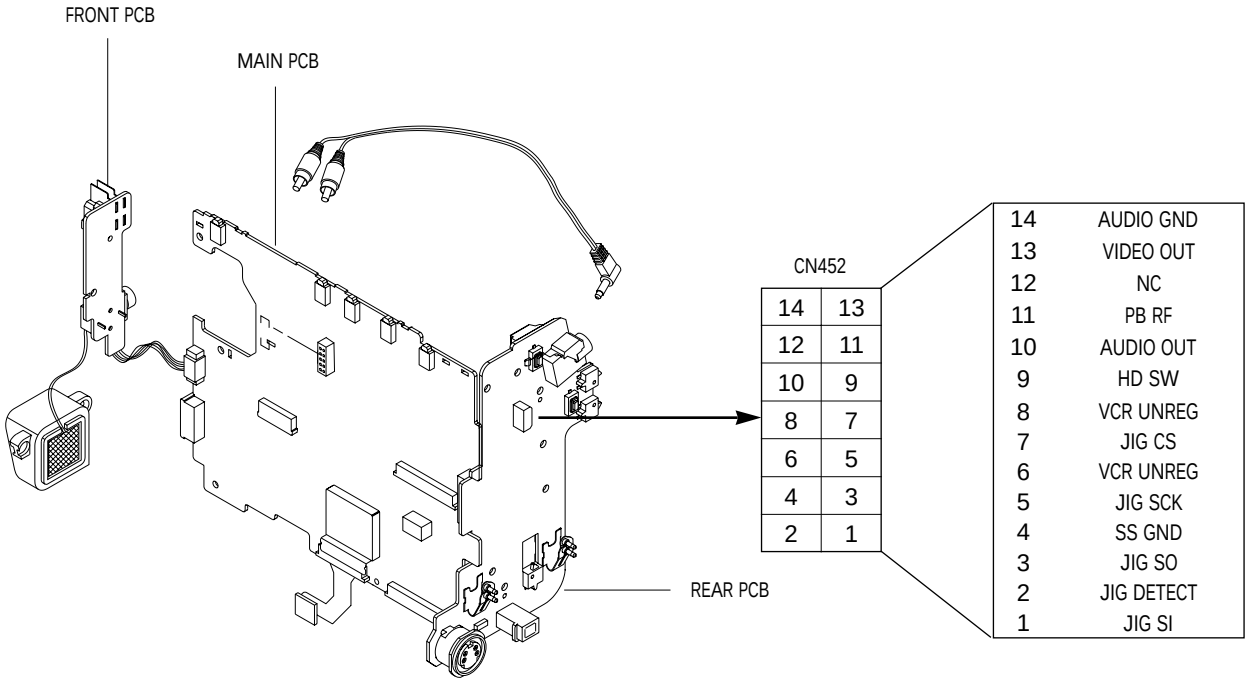


Fig. 3-18 Video Signal Connection

3-4 DECK Adjustment

3-4-1 Operation Without Housing Assembly

1. Remove the Housing Ass'y from the recorder unit.
2. Connect the mechanical chassis to the recorder circuit to supply voltage.
3. Set to Unload mode.
4. Press the S/W Push (Keep ON status) and make loading.
5. Push the Play key.

Note : For the removals of the Housing Ass'y, refer to the page 4-7.

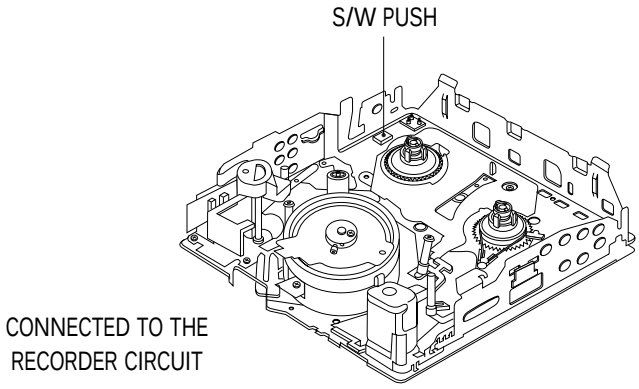


Fig. 3-19

3-4-2 Setting Mechanical Mode (Without Recorder Circuit)

1. Set the power-supply output to approx. 3V.
2. Choose the polarity (depending on whether loading or unloading).
3. Supply the voltage to the Motor Loading, and set to the desired mode.

Table 3-3

Drum side	Opposite side	Movement of Chassis
+	–	Loading
–	+	Unloading

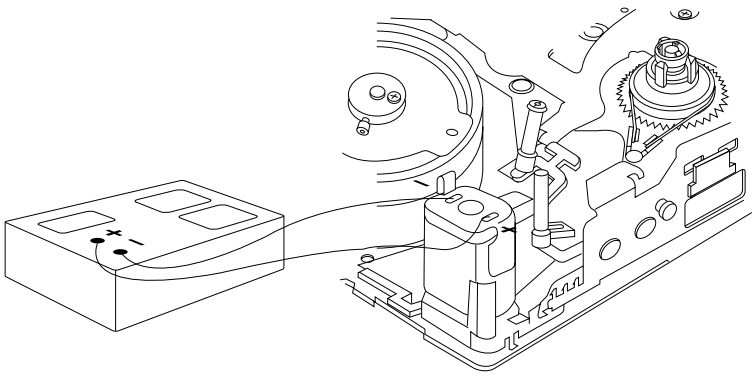


Fig. 3-20

3-4-3 Maintenance

Carry out the following periodic maintenance checks in order not only to fully exhibit the functions and operate the set, but also for the equipment and tape. After repairing, service the set as follows :

1) Cleaning of Drum Assembly

1. Gently apply lens tissue soaked in ethyl alcohol to the Drum assembly.
   Clean the Upper Drum assembly while rotating it slowly counterclockwise (by hand).

Note : Do not rotate the motor by power or rotate the Upper Drum assembly clockwise. Also, the Head tip will be damaged if the lens tissue is moved in a perpendicular direction.
Be sure to follow these instructions when cleaning the Drum Ass'y.

2) Cleaning of Tape Path

1. In EJECT mode, clean the tape path system (from Pole Tension P1 through Pole Review P7, Pinch Roller and Capstan Shaft) and the Lower Drum. Using the lens tissue soaked in ethyl alcohol.

Note : Make sure that no oil or grease adheres to the lens tissue.

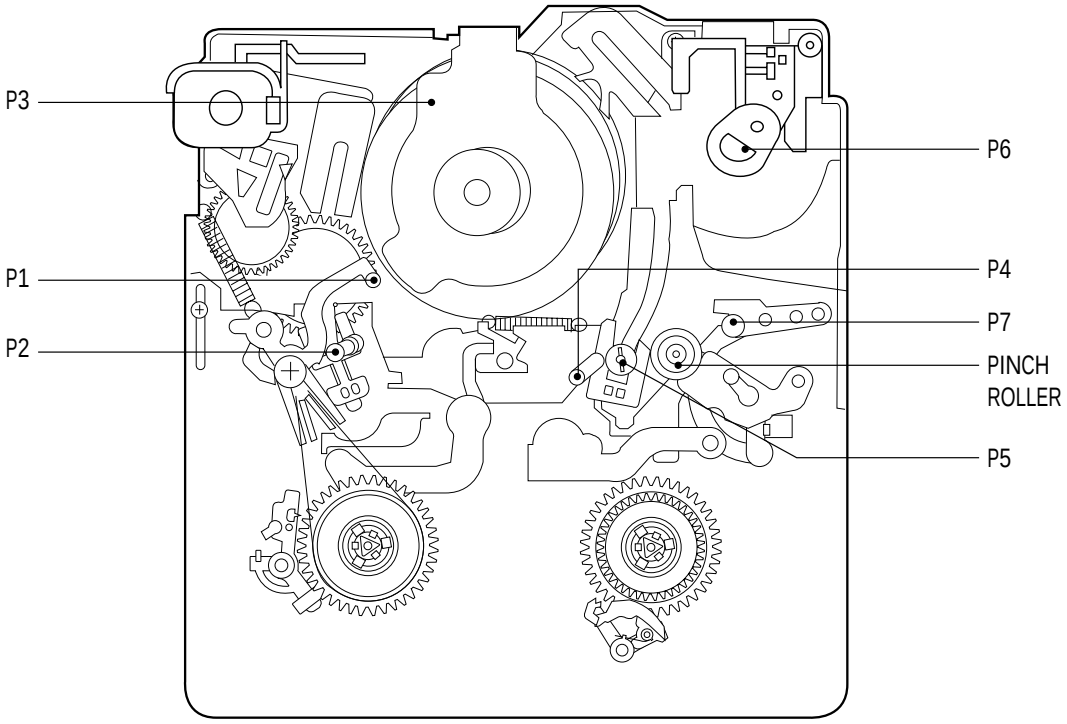


Fig. 3-21

3) Periodic Maintenance and Check List

When overhauling, refer to the following table.

Table 3-4

Maintenance and check items		Hours of use (H)										Remarks
		500	1000	1500	2000	2500	3000	3500	4000	4500	5000	
Tape path system	Cleaning of tape path	O	O	O	O	O	O	O	O	O	O	
	Cleaning and degaussing of drum assembly	O	O	O	O	O	O	O	O	O	O	
Driving system	Capstan Shaft		Δ		Δ		Δ		Δ		Δ	Be absolutely careful not to get oil on the tape path surface.
	Gear Capstan		Δ		Δ		Δ		Δ		Δ	
	Gear Pulley Shaft		Δ		Δ		Δ		Δ		Δ	
	Belt Timing		◆		◆		◆		◆		◆	
	Motor Loading		◆		◆		◆		◆		◆	
Performance	Abnormal noise		◆	◆	◆	◆	◆	◆	◆	◆	◆	
Confirmation	Back tension measurement		◆		◆		◆		◆		◆	
	Brake system		◆		◆		◆		◆		◆	
	PB, REV torque measurement		◆		◆		◆		◆		◆	

O : Cleaning Δ : Oil ◆ : Confirmation

◆ When lubricating bearings, be sure to keep the oil free of dust. (Oil contaminated with dust might cause the bearings to wear out or seize.)

◆ A “drop” of oil is defined as the amount attached to the tip of a ø 2mm stick as shown in Fig. 3-22.

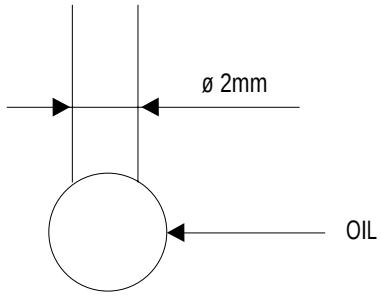


Fig. 3-22

3-4-4 Mechanical Check and Adjustment

1) Tension Regulator Adjustment

(A) DISASSEMBLY

1. Refer to the page 2-7 to remove the Housing Ass'y.

(B) ADJUSTMENT

1. Set to PB mode (without cassette tape).
2. Check that the overlap between external surface of Chassis Sub and external surface of Arm Tension is 0 ~ 1mm. (Fig. 3-23)
3. If necessary, proceed to step 4.
4. If the Arm Tension 1 is located inside the position specified, adjust the Band Adjust Tension 2 toward arrow A.
   If it is located outside, adjust toward arrow B.

Note : Check if the arm tension can be moved toward arrow C in PB mode. Use the tape which is fed to the end.

(C) REASSEMBLY

1. Refer tothe page 2-7 to mount the Housing Ass'y.

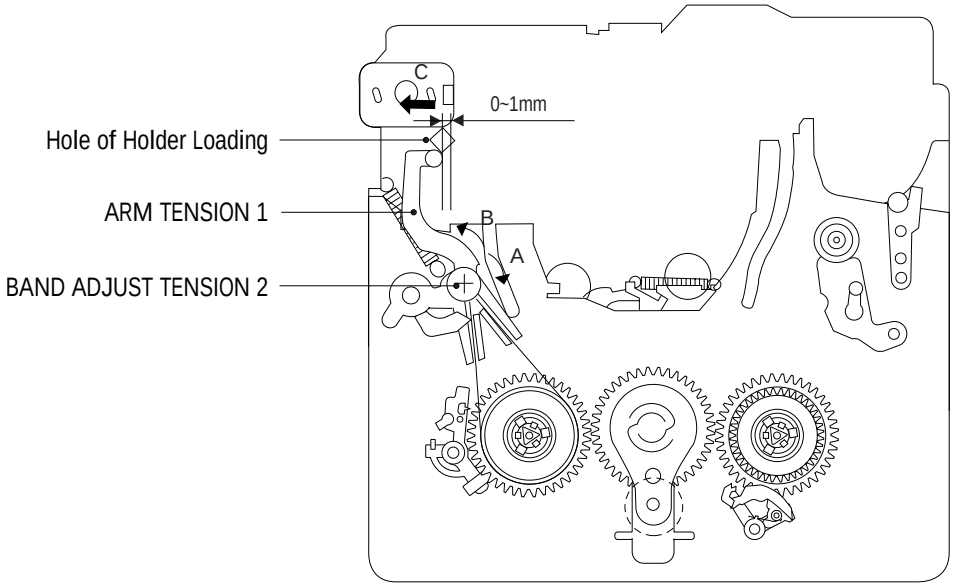


Fig. 3-23

2) Back Tension Adjustment

1. Set up the cassette-torque tape.
2. Set to PB mode and check that the torque value of Reel S is 9 ± 1.5g.cm.
   (If necessary, proceed to step 3 or 4).
3. If the value is too high : While pushing the adjustment claw (rack shape) of Slider Tension toward arrow C, shift the meshing position (with the claw of Slider Tension toward arrow A).
   See Fig. 3-24.
4. If the value is too low : While pushing the adjust ment claw (rack shape) of Slider Tension toward arrow C, shift the meshing position (with the claw of Slider Tension toward arrow B).
   See Fig. 3-24.

Note : When shifting the position of hooks, remove the cassette torque tape.

3) PB/REV Torque Check

1. Set up the cassette torque tape.
2. Set to PB mode, and check that the torque vlaue of Reel T is 9 ± 3g.cm.
3. Set to REV mode, and check that the torque value of Reel S is 25 ± 5g.cm.
4. If necessary, replace the defective reel assembly.

* Remarks : If the cassette torque tape is recorded both in the LP/SP modes by mistake, the torque at the switching point between SP/LP modes becomes unstable. In that case, do the torque adjustment in REC mode.

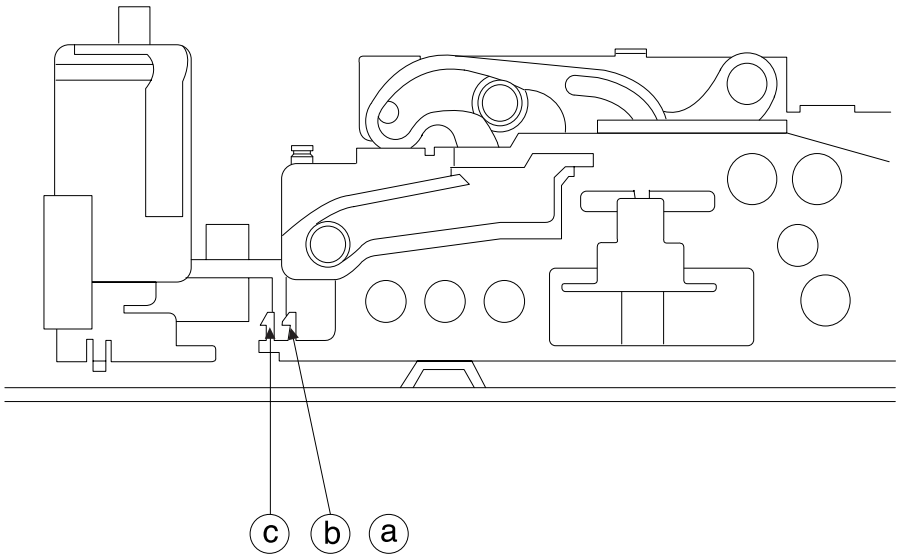


Fig. 3-24

4) Reel Table Height Check

(A) REMOVAL

1. Refer to the page 2-7
 ; Remove the Housing Ass'y.
2. Refer to the page 2-9
 ; Remove the Idler Ass'y.

(B) CHECK

1. Using the slide calipers, check the following distances: The upper surface of the P.C.B Reel to the Reel S table resting surface and the Reel T table resting surface should each be 5.7 ± 0.2mm.

(C) MOUNTING

1. Refer to the page 2-9
 ; Mount the Idler Ass'y.
2. Refer to the page 2-7
 ; Mount the Housing Ass'y.

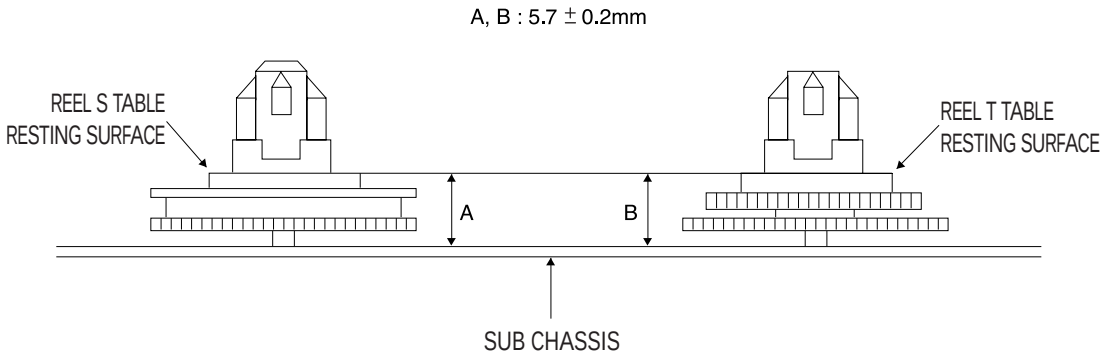


Fig. 3-25

3-4-5 Tape Path Adjustment

1) Preparation for Adjustment

1. Clean the tape running surface (Poles, Drum, Capstan Shaft, Pinch Roller).
2. Refer to the Service Manual (of camcorder). Observe the PB RF signal and Head Switching Pulse on an oscilloscope.
3. Play back the alignment tape.
4. Check that the waveform of the RF signal is flat both at the inlet and outlet (Fig. 3-26 A). If not flat (B or C in Fig. 3-26), do adjustments 2) through 5).

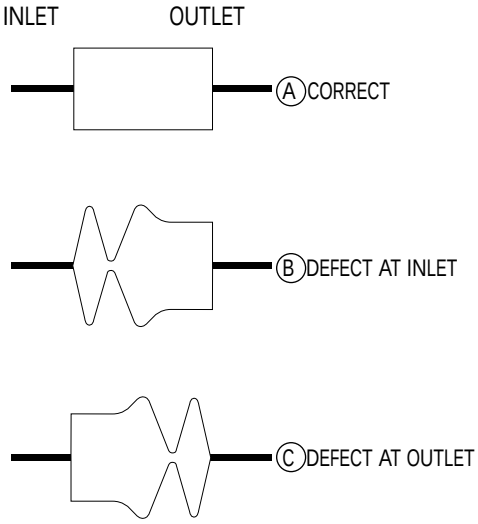


Fig. 3-26

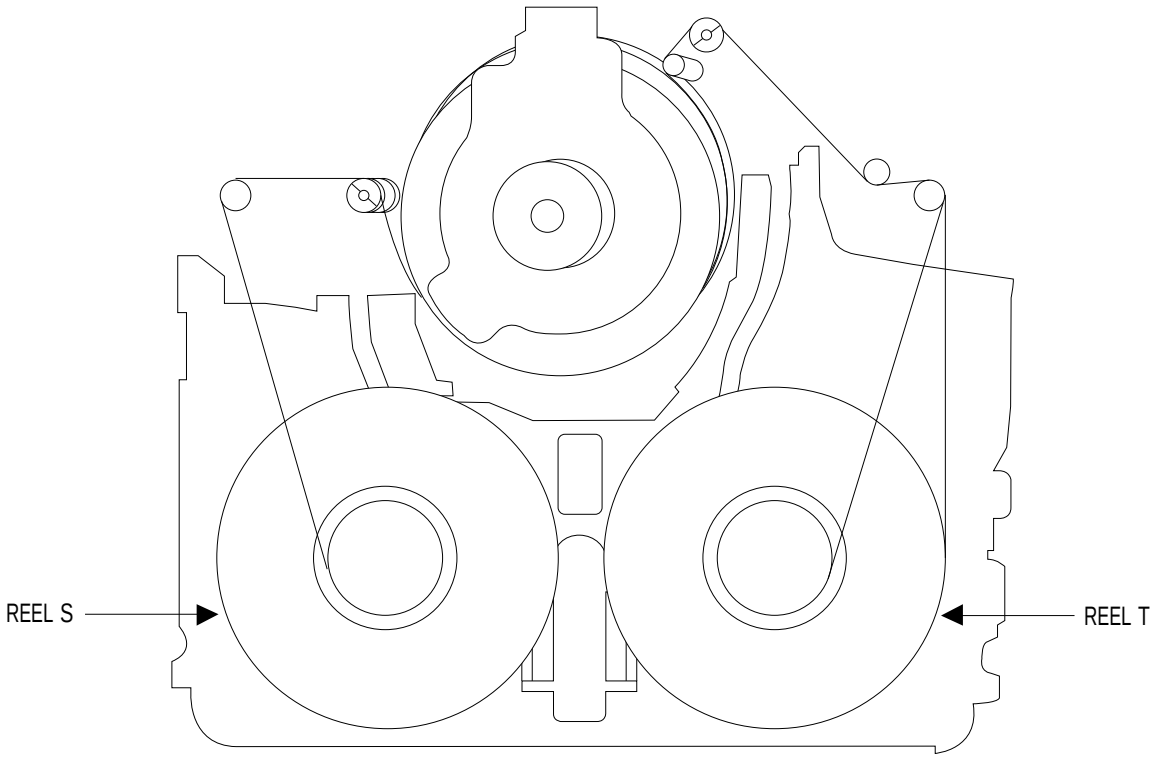


Fig. 3-27

2) Tracking Adjustment

1. Play back the alignment tape. (Tracking B or C)
2. Turn P2 to flatten the waveform at the inlet.
3. Turn P5 to flatten the waveform at the outlet.

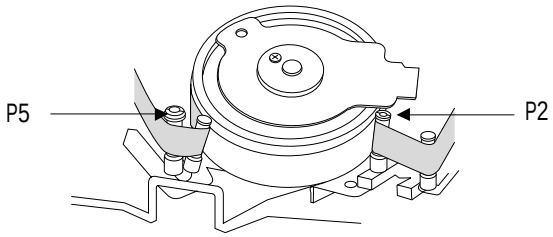


Fig. 3-28

3) Not Adjustment

1. Play back the alignment tape, and confirm that the tape is not loosened between the Capstan Motor and Cuide Roller T.
2. Set to REV mode and observe the outlet waveform of PB RF signal. (Fig. 3-30)

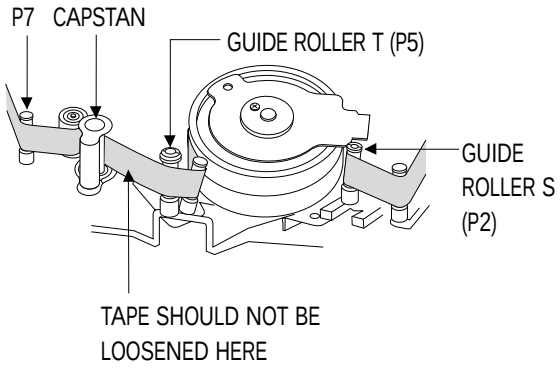


Fig. 3-29

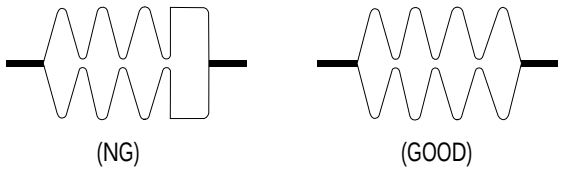
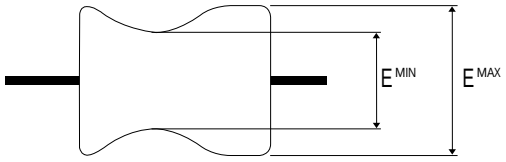


Fig. 3-30

4) Check After Adjustment

(A) TRACKING CHECK

1. Play back the alignment tape.
2. Then, Confirm that the minimum amplitude value (E min.) is 65% of the maximum value (E max.) or larger. (Fig. 3-31)
3. Confirm that no large fluctuations occur on the waveform. (Fig. 3-32)



$$\frac{E^{MIN}}{E^{MAX}} \geqq 65(\%)$$

Fig. 3-31

(B) CUE AND REV CHECK

1. Play back the alignment tape, and set to REV mode. Confirm that the waveform peaks have a uniform pitch. (Fig. 3-33Ⓐ)
2. Set to CUE mode. Confirm that the waveform peaks still have a uniform pitch. (Fig. 3-33Ⓑ)

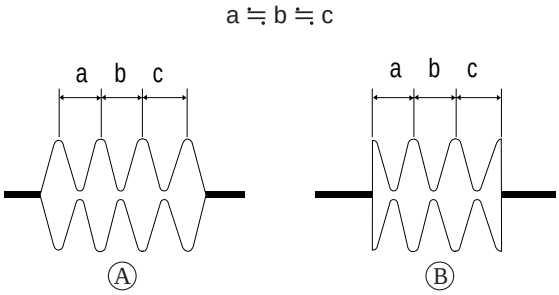
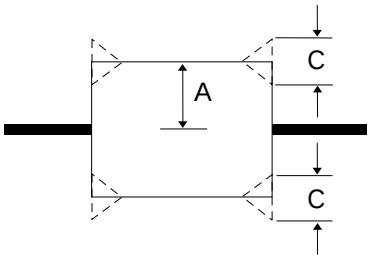


Fig. 3-33



$$C \leqq \frac{1}{8} A$$

Fig. 3-32

(C) RISE TIME CHECK

1. Play back the alignment tape.
2. Set to playback mode, and confirm that the waveform of PB RF signal rises flatly within 3 seconds. Also confirm that the tape is not loosened or curled around the Pinch Roller. (Fig. 3-34)
3. Run the tape in CUE/REV and FF/REW modes, then playback. Confirm the waveform of PB RF signal rises flatly within 3 seconds. Also confirm that the tape is not loosened or curled around the Pinch Roller.
4. Repeat steps 2. and 3.

(D) TAPE PATH CHECK

1. In CUE and REV modes, check that the tape is not too curled around the P2 Upper Flange, P5 Upper Flange, and P7 Upper/Lower Flanges. (Fig. 3-35)

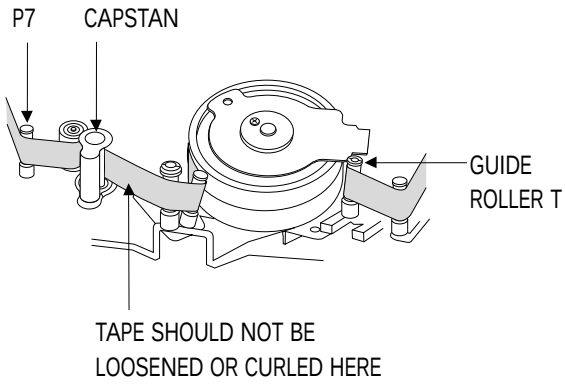


Fig. 3-34

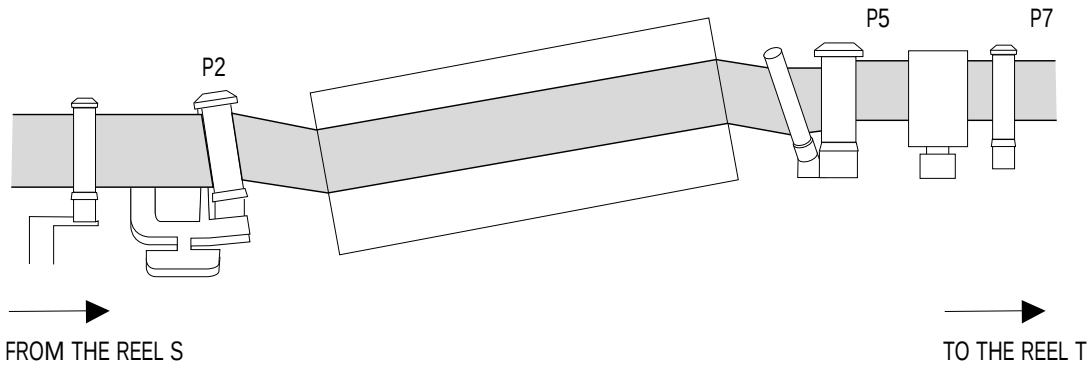


Fig. 3-35